

## REVIEW ARTICLE

# Management of Biomedical Waste in Dental Clinics

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## ABSTRACT

Dental waste can be hazardous to humans and the environment. Proper handling, treatment, and disposal of biomedical wastes are important elements of health care office. Properly designed and applied, waste management can be a relatively effective and an efficient compliance-related practice. Some wastes from health care facilities, however, are contaminated. If not disposed of properly, contaminated wastes may carry microorganisms that can infect the people who come in contact with the waste as well as the community at large. Care is required when disposing of clinical waste, to protect and maintain the immediate environment from contamination, and to ensure the safety of those who come into contact with it. It is time that the curriculum for medical, paramedical, and dental education give due importance to this vital issue.

**Keywords:** Biomedical waste, Dental clinics, Dental education, Waste management.

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## INTRODUCTION

Poor waste management practices pose a huge risk to the health of the public, patients, and professionals and contribute to environmental degradation. Dental practices generate large amounts of waste, such as cotton, plastic, latex, glass, and other materials, most of which may be contaminated with body fluids. Dental practices also produce small amount of other types of waste, such as mercury, silver amalgam, and various chemical solvents.<sup>1</sup>

Government of India under its gazette notification from the Ministry of Environment and Forests informed to all concerned that no one can dispose any kind of waste, general or biomedical waste, in the open. Disposal of harmful waste produced by dentists and clinics can pollute the environment. Dental biomedical waste disposal in the roadside bins can infect the municipal waste collectors if they are not properly protected. In view of this, most nations have introduced best management practices for hazardous dental waste disposal.

Biomedical waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities. This waste is potentially hazardous, the main hazard being infection, and may pose a serious threat to human health if management is indiscriminate and unscientific. Proper collection and segregation of biomedical waste are important.<sup>2</sup>

Dental practices produce tiny amount of other types of waste, such as silver amalgam, mercury, and various chemical solvents. The dentists generate only 3% of total medical waste estimated by US medical waste tracking system.<sup>3</sup>

An increasing variety of items that have hitherto been reused are now designed to be disposable, such as custom tips and triple syringe tips. Operating gloves are worn for almost all patient contact, resulting in a substantial increase in the amounts of latex and vinyl entering the waste stream. Surgical instruments, such as local anesthetic needles, scalpel blades, and suture needles, constitute a special category of contaminated sharp items.<sup>4</sup>

Waste disposal from dental practices can be divided into two main areas. First, there is environmental burden of various hazardous products, and second, the more immediate risks of potentially infectious material that may be encountered by the individuals handling the waste. In 1998, the Ministry of Environment and Forest in India defined biomedical waste as, "Any waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities used in production or testing of biologicals." Dental waste is a subset of the hazardous biomedical waste. Dental practices generate large amounts of cotton, plastic, latex, glass, sharps, extracted teeth, and morally it becomes the responsibility of the health care provider. Chemical wastes, such as lead foil mercury from amalgam restorations, photographic chemicals like fixer, and developer are also generated in dental practice, which if not safely disposed can pose a threat to the environment and public health.<sup>5</sup>

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Hospital-acquired infections have been estimated at 10% in the Southeast Asian region and identified as one of the indicators needed for the management of waste; an alarming situation. World Health Organization reported a 50% reuse in India of syringes and needles which are meant for single use.<sup>6</sup>

## POLICIES AND STRATEGIES FOR WASTE MANAGEMENT<sup>2</sup>

- Strategies for minimizing the quantities of biomedical waste generated and disposed off.
- Methods of segregating, packaging, labeling, moving, storing, treating, and transporting the various waste types (both on- and offsite, as appropriate).
- Methods for keeping records of the quantities of biomedical waste generated, treated, and disposed off.
- A list of all regulations and legislation concerning biomedical waste that is applicable in the facility's jurisdiction.
- A list of those responsible for managing biomedical waste in the event of an accident or spill.
- Provision for regular, ongoing staff instruction about proper handling and potential hazards of biomedical waste. Certain basic elements must be embodied in any biomedical waste management program to ensure that biomedical waste is handled and disposed off safely and efficiently.

## COLOR AND TYPE OF CONTAINER FOR DISPOSAL OF BIOMEDICAL WASTES<sup>7</sup>

| Color coding           | Type of container                     | Waste   |
|------------------------|---------------------------------------|---|
| Yellow                 | Plastic bag                           | Cat. 1, Cat. 2, Cat. 3, and Cat. 6<br>Incineration/ deep burial                               |
| Red                    | Disinfected container/ plastic bag    | Cat. 3, Cat. 6, and Cat. 7<br>Autoclaving/ Microwaving<br>Chemical treatment                  |
| Blue/white Translucent | Plastic bag/ puncture Proof Container | Cat. 4 and Cat. 7<br>Autoclaving/ Microwaving<br>Chemical treatment<br>Destruction/ shredding |
| Black                  | Plastic bag                           | Cat. 5, Cat. 9, and Cat. 10 (solid)<br>Disposal in secured landfill                           |

## MANAGEMENT OF COMMON HAZARDOUS WASTE IN DENTAL CLINICS

### Mercury Containing Waste

Dental amalgam particles are a source of mercury which is known to be a neurotoxic, nephrotoxic, and

bioaccumulative element. It can get into the environment through wastewater, scrap amalgam, or vapors. Vaporous mercury waste management includes:

- Stored unused elemental mercury in a sealed containers
- Contact to a certified biomedical waste carrier (CWC) for disposal and recycling
- Use a "mercury spill kit" in case of a spill of mercury
- Unused elemental mercury reacts with silver alloy to form scrap amalgam
- Not placing elemental mercury in the garbage
- Do not wash elemental mercury in the drain. Scrap amalgam waste management implicates:
  - Using suction traps and disposable amalgam separators on dental suction units; to prevent amalgam accumulation the trap should be changed weekly,
  - Required amalgam amount only mixed or use premeasured amalgam capsules
  - Do not throw extracted teeth filled with amalgam in the regular garbage
  - Use mercury containers to store all scrap/old amalgam.<sup>8</sup>

### Scrap Amalgam

For the management of scrap amalgam: Mercontainer TM (sponge type) is appropriate to store the scrap amalgam. Empty amalgam capsules can be disposed in the garbage due to nonhazardous in nature.

Using an ISO 11143 compliant amalgam separator on the suction lines is suitable for removing over 95% of the contact amalgam before diffusing in the sewer system.

Disposable suction traps on your dental units should be changed weekly. Always use gloves, mask, and glasses while cleaning the suction traps. Disposable trap should be placed into a properly labeled container of Mercon-vapTM solution for proper disposal. After filling it, a certified waste carrier should be contacted for recycling or disposal of it.<sup>9</sup>

### Silver-containing Wastes

Spent X-ray fixer used in dental clinics to develop X-rays is a hazardous material that should not be simply rinsed down the drain. After desilvering the fixer with a recovery unit, it can be mixed with developer and water and disposed down the sewer or septic system. Spent developer is permitted to be discharged in the above systems after dilution with water. The silver should be handed over to the CWC. Using a digital X-ray unit and an X-ray cleaner without chromium are other suggested safety measures.

Undeveloped X-ray films contain a high level of silver and must be treated as hazardous waste. It is advisable to collect any unused film that needs disposing in a recommended container for recycling by the disposal company.

Using a digital X-ray unit minimizes purchase of new X-ray films.<sup>10</sup>

### Lead-containing Wastes

The lead foil inside X-ray packets and lead aprons contain leachable toxin, which can contaminate soil and ground-water in landfill sites after disposal. These should only be handed over to CWC. High doses of lead intake lead to reproductive toxicity, neurotoxicity, carcinogenicity, hypertension, renal function, immunology, toxicokinetics, etc.<sup>11</sup>

### Blood-soaked/Dripping Gauze

Is a biomedical waste hazardous waste? Biomedical waste should be enclosed in a yellow biomedical waste bag covered with a double bag, labeled with a biohazard symbol and refrigerated, if onsite for more than 4 days. Once accumulated, a CWC should be contacted for disposal.<sup>12</sup>

### Sharps

Needles, scalpels, glass carpules, burs, acid etch tips, files, blades, and other sharp objects: The waste management of these sharp objects includes collection in a white/blue puncture-resistant container with a lid that cannot be removed. The container should be properly labeled with biohazard symbol and once full, the CWC should be contacted for disposal.<sup>13</sup>

### Chemicals, Disinfectants, and Sterilizing Agents

Staff handling these materials should be trained in Workplace Hazardous Materials Information System (WHMIS). Whenever possible, use steam or dry heat to sterilize dental instruments. Nonchlorinated plastic containers [not polyvinyl chloride (PVC)] should be preferred to minimize environmental impacts and placed in the solid waste stream. Halogenated sterilants have a detrimental effect on environment. Ignitable sterilants should not be poured down the drain as they have potency to explode. Formaldehyde sterilants also should not be disposed down a drain. One should not pour sterilants into a septic system as this may significantly disrupt the bacteria, which normally breakdown wastes.

### MANAGEMENT OF NONHAZARDOUS WASTES IN DENTAL CLINICS

Paper, cardboard, aluminum, plastics, etc.: their use should be minimized. Containers or packaging made of PVC plastic should be avoided where feasible, as this is difficult to recycle and can produce acid gases if incinerated. Paper waste, cardboard, and plastic containers (clean or rinsed) should be recycled where the service exists.

We wish to emphasize that in addition to health risks, improper waste management also has an impact on the

environment causing pollution of water, air, and soil. The need of the day is to sensitize the dentists to the various types of waste, their generation, segregation, collection, transportation, and final disposal.<sup>14</sup>

### CONCLUSION

Safe and effective management of waste is not only a legal necessity but also a social responsibility, but a large proportion of the dentists are not practicing proper methods of dental health care waste disposal. Lack of concern, motivation, awareness, and cost factor are some of the problems faced in the proper hospital waste management. Proper surveys of waste management procedures in dental practices are needed. The existence of legislation governing dental health care waste disposal alone is not sufficient to motivate many practitioners to comply with guidelines. Rules in the form of Acts are also inadequate and lack of commitment to implement these Acts is common.

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